(System configurations vary, and yours may not appear exactly as above)

PuriFire 4S10F User's Manual

Fire Truck Integrated Emergency Water Purification System

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Congratulations!

You have purchased the world only fire truck integrated water purification system today. You have taken a major step in providing the quality drinking water to better protect people and lives under disasters and emergency situations.

The PURIFIRE® 4S10F water purification system is a uniquely designed system that provides drinking water when municipal water is not available during a disaster or emergency event, and dramatically lowers the huge cost of transporting bottled water and eliminates the problem caused by plastic bottles thereafter.

PURIFIRE® 4S10F provides clean, clear, better-tasting water while eliminating the potential bacteriological problems associated with ordinary filtration systems.

This process represents the best green technologies available to remove unwanted impurities yet retain good taste.

According to a study conducted by the United Nations, polluted water is one of the major causes of infectious diseases. The new PURIFIRE® 4S10F system provides safe drinking water when municipal water is not available or contaminated during natural disaster events.

PURIFIRE® 4S10F utilizes ultraviolet light and ozone to disinfect water because they have proven to be the most effective method to kill bacteria and viruses in your drinking water, while leaves no chemical residuals in your water. The UV device has extensive energy which far exceeds other residential devices.

Before beginning installation and operation procedures, read the OWNER'S MANUAL thoroughly. Please make sure to return WARRANTY REGISTRATION CARD within 30 days of purchase.

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Overview

Darley PURIFIRE® 4S10F System is designed to supply drinking water from surface water source which polluted by natural or man-made disasters. It is a compact, self-contained, fire pump driven water purification system, which mounted inside of a fire truck pump house with dedicated control panel for easy operation and maintenance.

PURIFIRE® 4S10F is the first fire truck integrated water purification system designed in the world, with advanced filtration and chemical free disinfection technology, it brings the best quality drinking water from freshwater sources contaminated with biological and chemical substances. The system is US patent pending and PuriFire® is the registered trademark of Darley water purification system.

One operator can set up and operate the system within 5 minutes. The system is able to produce drinking water at 12,000 gallons per day with minimum power consumption. PuriFire® 4S10F is a great addition to your fire and emergency service team and running the system will not hamper the ability to put off fire.

PuriFire® 4S10F helps better to protect people and lives during hurricane, earthquake, and flooding events, and provide a better way to deliver safe drinking water on-site, on time and with much less greenhouse gases emission.

Safety information

Read Instructions - All safety and operating instructions should be read before the unit is operated.

Retain Instructions - Safety and operating instructions should be kept in an accessible area for future reference.

Follow Instructions - All instructions should be followed for maintaining and operating your PuriFire® System properly.

Maintenance Precautions - Always turn off the water supply and turn off power switch from the PuriFire® System before performing any maintenance.

Accessories - Do not use any accessories, including filter cartridges that are not recommended by Darley PuriFire®.

Water or Moisture - Do not allow moisture to contact any internal or external electronic components. Should a leak occur, immediately shut off the water supply and contact your dealer or distributor for service.

Installation - Install your PuriFire® System in compliance with state and local laws and regulations for plumbing and electrical codes.

> **Caution:** Do Not use any damaged component. If damage is found, contact your dealer before proceeding.

Grounding - This product must be grounded. If it should malfunction or breakdown, grounding provides a path of least resistance for electric current to reduce the risk of electrical shock. This system is equipped with a cord having an equipment-grounding conductor and a grounding plug. The plug must be plugged into an appropriate outlet that is properly installed and grounded in accordance with all local codes and ordinances.

Danger – Improper connection of the equipment-grounding conductor can result in a risk of electrocution. Check with a qualified electrician or service personnel if you are in doubt as to whether the outlet is properly grounded. Do not modify the plug provided with this system – if it will not fit the outlet, have a proper outlet installed by a qualified electrician. Do not use any type of adapter with this system.

Ground fault circuit interrupter protection - To comply with the National Electrical Code (NFPA 70) and to provide additional protection from the risk of electric shock, this system should only be connected to a properly grounded, grounding-type power supply receptacle that is protected by a Ground Fault Circuit Interrupter (GFCI). Inspect operation of GFCI as per manufacturers suggested maintenance schedule.

Extension cords - If an extension cord is necessary, use only 3-wire extension cords that have 3-prong grounding-type plugs and 3-pole cord connectors that accept the plug from this system. Use only extension cords that are intended for outdoor use. Use only extension cords having an electrical rating not less than the rating of the system. A cord rated for less amperes or watts than this system rating may overheat. Exercise caution when arranging the cord so that it will not be tripped over or pulled. Do not use damaged extension cords. Examine extension cord before using and replace if damaged. Do not abuse extension cord. Keep extension cord away from heat and sharp edges. Always disconnect the extension cord from the receptacle before disconnecting this system from the extension cord. Never yank cord to pull plug from outlet. Always grasp the plug and pull to disconnect.

System Capability

1. Daily drinking water output (20 hours per day operation):
   - 12,000 gallons per day from freshwater sources.
2. Ready to use within 5 minutes of being deployed.
3. Eliminate/remove sediment particles, pathogens, bacteria, viruses, heavy metals from contaminated water sources.
4. Minimum training and maintenance need and continuously operated by one person.
5. US Patent pending technology on water purification system integrated into a fire truck; no additional pump is needed to run the purification system.
6. Filters/strainers are completely flushable by turning on switches on the control panel.
7. Chemical free disinfection technologies to meet EPA drinking water standards.
8. Easy to access components inside of the pump house for calibration and maintenance needs.

Operation

The PuriFire®4S10F has its dedicated control panel at the passenger side of pump house. The control panel has LED light on the top to enable operator to observe meters and gauges mounted on the panel.

Figure 1 PuriFire® 4S10F Control Panel (front side)

1. **The TDS monitor**:

The TDS monitor has been calibrated to have total dissolved solids level in ppm (mg/L), the monitor check the water temperature as well because the TDS level is temperature sensitive.

DO NOT drinking the product water if the readout is greater than 1,000 ppm.

2. **The Master Pressure Gauge:**

This gauge monitors water pressure at the beginning of the purification system. The whole purification system is designed to work under 90 psi. If incoming water pressure is greater than 90 psi, it may damage fittings & filter housings and may cause leaking.

Moreover, the higher pressure with higher flow rate may exceed the capacity of disinfection devices and therefore the water may NOT safe for drinking.
Use the Master Pressure Gauge to calibrate the pressure relief valve, so whenever the water pressure exceeds 90 psi, water will be discharged or directed back to the water tank, so to keep the system in a safe working condition. Refer to the calibrate chapter for how to set the pressure relief valve at proper valve.

3. **The Master Switch:**

Turn the switch ON when operating the purification system. The master switch controls all electric devices in this purification system, which including the TDS monitor, power inverter, UV system and Ozone system.

It is important to turn OFF the power switch when not operating the purification system.

4. **The Filter Gauges:**

There are three (3) filter gauges on the control panel to monitor the pressure drops in real time. When the purification system is running in a normal condition, the operator will observe the pressure difference between the master pressure gauges and the filter gauges. The master pressure gauge will always has higher readout than the that of the filter gauges, when the operator observe the same pressure readouts from these four gauges, that means the outlet of the system is shutoff (faucet is closed, i.e.).
When the pressure difference is greater than 15 psi, which means the filters/strainers are significantly blocked due to accumulation of sediments from the raw water. Turn on the five (5) switches which control the solenoid drain valves to flush the strainers/filters, which will help to flush out sediments in the strainer and filter housings. Continue flushing the system for 30 seconds to 1 minute, and then close the flush valve to see if the pressure difference is smaller than 15 psi.

Filter cartridge change is needed when experiencing restricted flow or observing significant pressure drop and flushing the system does not help.

5. **The Master Drain:**

This switch to open/close flushing valves to drain all the filters/strainer when the system is not in use.

It is important to drain all water out during the winter time.

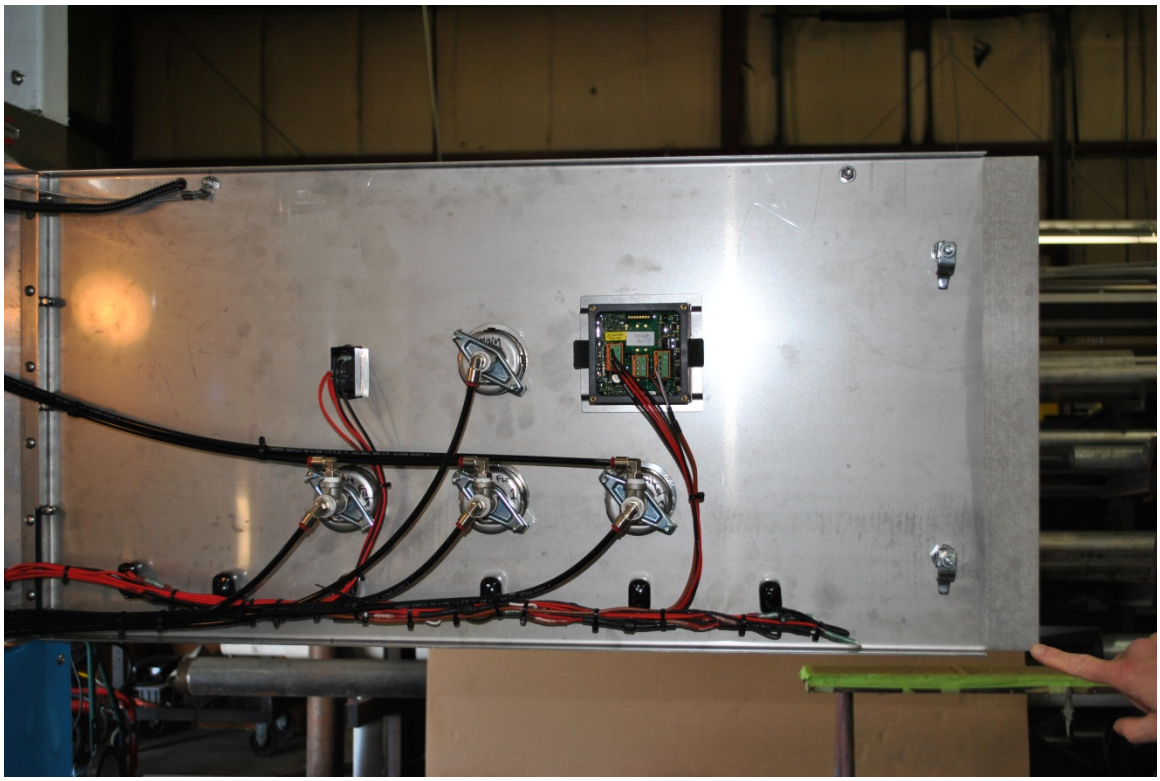


Figure 2 Purifire® 4S10F Control Panel (Back side)

6. **The PuriFire Control Valve:**

Pull the valve to control the water goes into the whole purification system, and make sure the water flow rate readout is less than 10 gpm. See below picture for locations of these control valve and flow meter.

Restricted flow may be observed by monitoring the flow meter, filter cartridges/strainer need to be replaced/cleaned when flow rate is significant restricted.

Figure 3 PuriFire® 4S10F Control Valve

7. Faucet and Drain:

Open the faucet before operating the purification system (before pulling out the PuriFire Control Valve) to allow air going out the fittings/hoses/filters. Collect to water directly out of the faucet for drinking or connect the faucet to a garden hose to reach out from the fire truck.

Please wait 3 minutes before drinking/collecting the water from the faucet. Operator needs time to make sure the system are working properly and the water quality are within safe drinking standards.

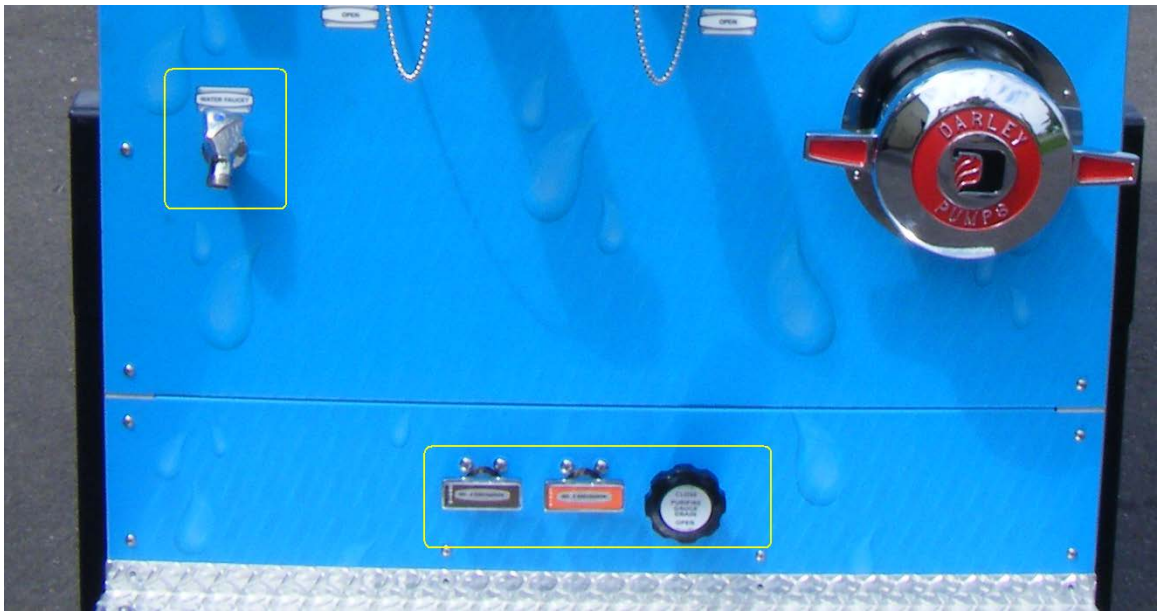


Figure 4 PuriFire® 4S10F Water Faucet and Drain

When draining out of water from the whole system for maintenance or storage purposes, be sure to push in the PuriFire Control Valve to shut off incoming water. At the same time keep the faucet ON to relieve pressure inside of the system. Open the drain valve to discharge remaining water inside of the tubings/fittings.

Components

The major components of the system are:

1. Sediment pre-filtration – to reduce the sediment level from the raw water down to 5 micron;
2. Carbon filtration and adsorption – Activated carbon has been used for hundreds of years to treat

   taste, odor, and color problems in water. Activated carbon has been proven to be an excellent media to produce better tasting water and to remove harmful water contaminants at a reasonable cost. Carbon used for filters may be manufactured from wood, coal, or coconut shells. The raw carbon is ground up and "activated" by heating the granules at a controlled temperature and pressure. This process causes the carbon granules to expand and create active sites where pollutants can be collected by adsorption. These new sites dramatically increase the total surface area and capacity of each granule.

   Adsorption is the physical process where certain water pollutants are attached to the surface of carbon particles as the water flows through the filter. The pollutants are removed from the water and locked into the carbon granule.

Activated carbon is also able to filter out sediment through a process of mechanical filtration. The particles are captured in the spaces between carbon granules.

3. UV disinfection Device (see details below)

UV disinfection device

Ultraviolet (UV) light from the sun has long been known for its ability to destroy microorganisms. However, it has only been in recent years that equipment producing UV light has been manufactured for residential use.

WARNING: NEVER LOOK DIRECTLY AT A LIGHTED UV LAMP. ULTRAVIOLET RAYS CAN BE HARMFUL TO EYES.

UV energy is produced by low-pressure mercury vapor enclosed in a tubular lamp. While a UV lamp resembles a standard fluorescent lamp, it is similar in appearance only.

Energy produced by the UV lamp has the ability to destroy microorganisms that can live in water. There are five major groups of microorganisms that are altered by a specific spectrum of ultraviolet light: viruses, bacteria, fungi, algae, and protozoa.

When these microbes are exposed to the proper amount of UV energy, their DNA structure is scrambled, and they are unable to reproduce. Since the cell is now sterile or dead, it is no longer a threat.

Figure 5 UV Device Control Panel

Bottoms and Display:

Item	Name	Description
A	Lamp timer display	Counts down from 365 days to show time for annual lamp replacement.
B	Lamp timer reset	After installing a new lamp, press and hold for five seconds to reset Lamp timer to 365.
C	Mute	Press to silence audible alarm. When the alarm is due to the lamp's age, the mute button will silence the audible alarm for 7 days; this may be repeated up to a maximum of 4 times. After that, the button will silence for only 24 hours. When the alarm is due to any other issue, the mute button will silence the audible alarm for 24 hours.

Indicator Lights on the UV controller:
Indicator lights only indicate a problem with the component when flashing red. The table below is a list of possible causes and solutions. Before replacing parts, please contact Darley Technical Assistance for any new troubleshooting techniques.

Lights	Green	Yellow	Flushing Red	Solid Red
1	UV dose is adequate and sensor is operating normally	UV dose is near the minimum required	Sensor disconnected; unplug system, reconnect sensor and plug-in system again. UV dose is below minimum required, see Low UV Alarm section	Sensor inactive due to lamp or power supply failure
2	Lamp operating normally.	Warning; lamp will require replacement shortly.	Lamp disconnected; unplug system, reconnect lamp and plug-in system again. Lamp failure; replace lamp	Lamp inactive due to power supply failure
3	Power supply operating Normally.	Air temperature around system is too warm	Power supply failure; replace power supply	Power supply inactive due to lamp failure

Consumables

Do not use any consumables, including filter cartridges that are not recommended by Darley PuriFire®, use third party replacement consumables will automatically void your warranty.

Darley and its dealer offer best quality consumables and accessories, to ensure best results, do NOT use any unauthorized parts on your PuriFire® 4S10F.

1. Two (2) sediment filters, 10" long – change monthly during continuous operation.
2. Strainer – Change every 12 months or damage is observed.
3. Two (2) carbon filters, 20" long – Change monthly during continuous operation.
4. UV lamp – Change every 12 months, the system will record its service life and trigger the service alarm when it reaches 12 months.

System Control and Processes

The purification system is composed of multi-stage filtration & disinfection processes, as well as the electric controlled flushing system, and water quality monitoring system.

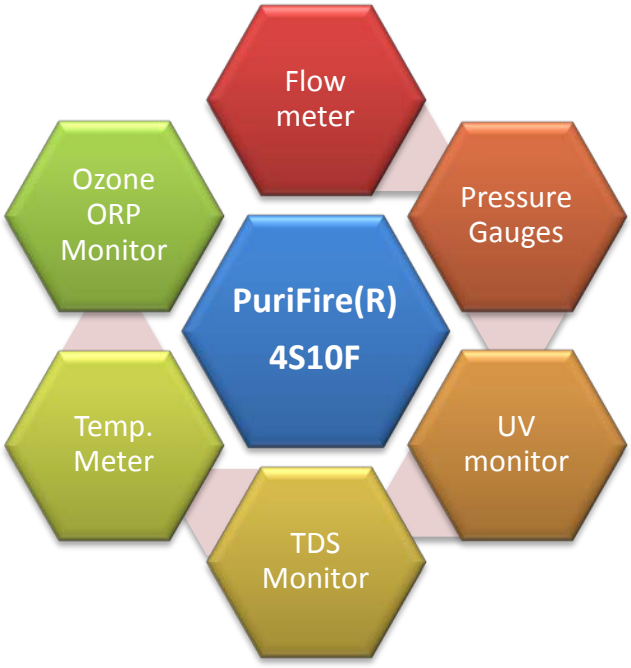


Figure 6 PuriFire® 4S10F Control & Monitoring Systems

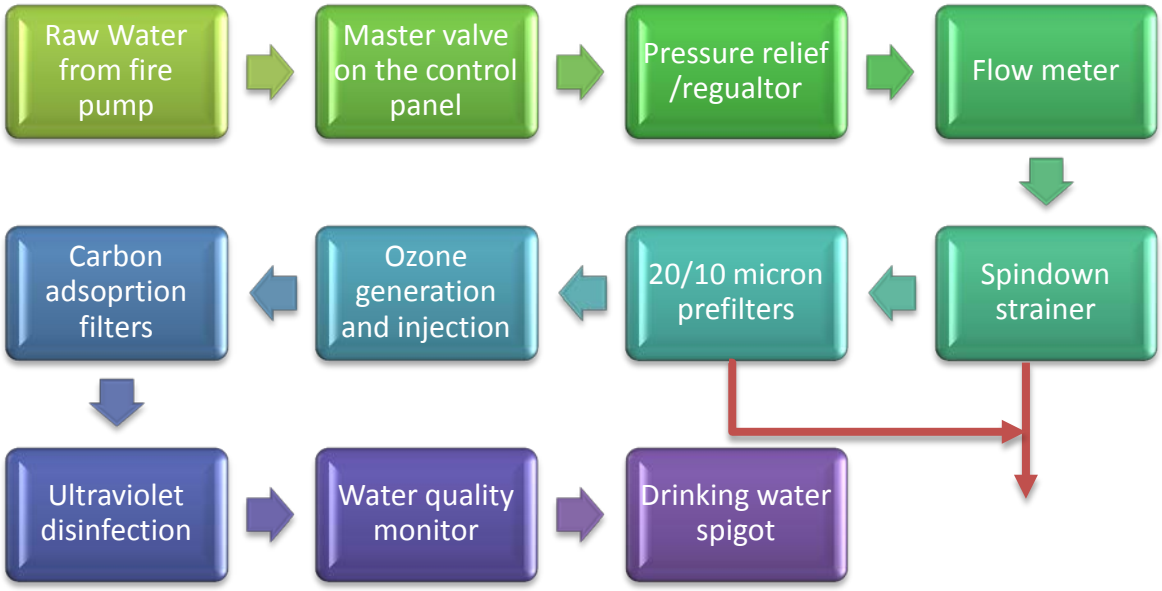


Figure 7 PuriFire® 4S10F Water Purification/disinfection Processes

Standard Compliance

In compliance with US EPA Guide Standard and Protocol for Testing Microbiological Water Purifiers with National Sanitary Foundation (NSF) certified major components.

W. S. Darley & Co. is proud to be a member of the Water Quality Association and a provider of water purification systems to the US Army.

MEMBER

Water Quality ASSOCIATION

Maintenance Guide

Under normal operation, the Spindown strainer requires no maintenance. While the screens need to be cleaned when they are blocked and causing significant pressure drop.

Usually, the regular maintenance requirement is of changing the filter cartridges every 5,000 to 10,000 gallons depending on the quality of water, and the UV lamp needs to be replaced once a year.

Individual usage and incoming raw water quality may dictate more frequent filter replacement. The filters should be replaced immediately if your water flow becomes restricted, or if bad taste and odors return, even if three (3) months have not yet elapsed.

		Quantity (for every Purifire® 4S10F system)				
Items	Part #	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Prefilter 1	VX01-10BB	4~8	4~8	4~8	4~8	4~8
Prefilter 2	VX05-10BB	4~8	4~8	4~8	4~8	4~8
Strainer Screen	SS -S	Check every month				
O-ring for BB housing	OR-100		5		5	
UV Lamp*	UV-10	1~4	1~4	1~4	1~4	1~4
Quartz sleeve*	QS-10	1~4	1~4	1~4	1~4	1~4
BB carbon block	CB-20-BB	4	4	4	4	4

- *Service/replace items when the unit is in continuous operation, otherwise these are not needed.
- Unit will need to be run twice a year at 5 hours continuously.

UV system cleaning & lamp replacement

1. Turn off Master Power Switch, and turn off power inverter. (Circled in yellow)

2. Shut off feed water supply valve and open downstream faucet.

CAUTION: Do not attempt to remove sumps until water flow stops. This reduces pressure inside the system so sumps may be safely removed.

CAUTION: Use care when sanitizing UV head. Do not get the UV control module or connectors wet.

3. Sleeve cleaning

Minerals in the water slowly form a coating on the sleeve. This coating must be removed because it reduces the amount of UV light reaching the water, thereby reducing purification performance.

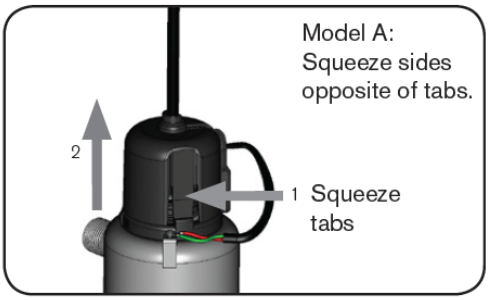
Basic models: please clean the sleeve regulary (3-4 times per year, or more often depending on water quality).

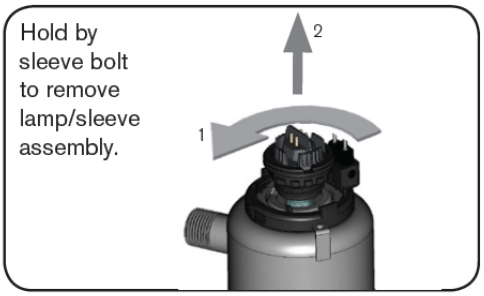
Plus models: the need to clean the sleeve will be indicated by a low UV alarm (flashing red indicator light beside the sensor on control panel - see Control Panel section for details).

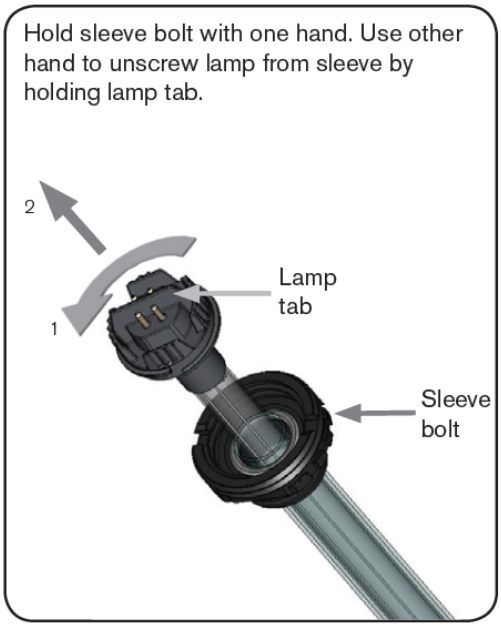
When only cleaning is required, follow instructions and re-install the current lamp.

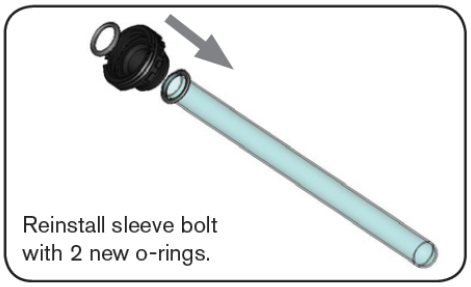
4. Lamp replacement

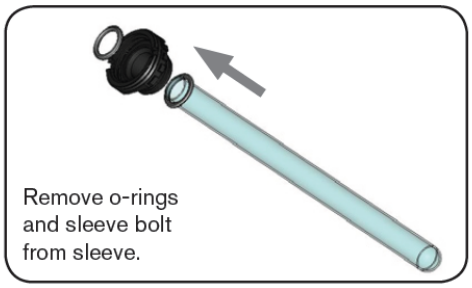
The amount of UV light created by the lamp decreases over time, requiring that the lamp be replaced every **12 months**. **NOTE:** The UV system is designed to operate continuously and should not be shut off for short periods of time, such as over a period of less than three weeks.


Model A:
Squeeze sides opposite of tabs.
2
1
Squeeze tabs

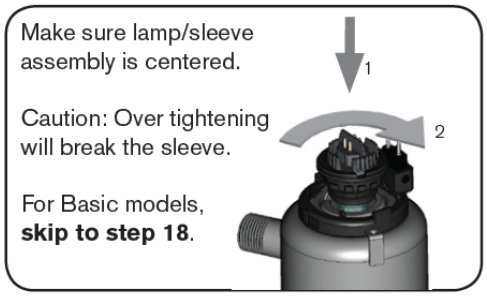

Hold by sleeve bolt to remove lamp/sleeve assembly.
2
1

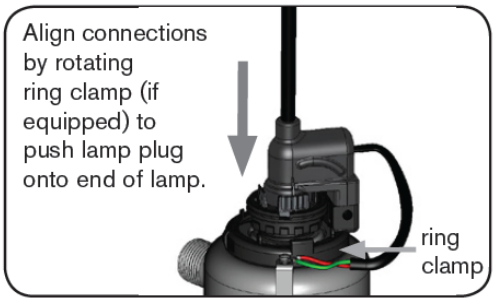

Hold sleeve bolt with one hand. Use other hand to unscrew lamp from sleeve by holding lamp tab.
2
1
Lamp tab
Sleeve bolt

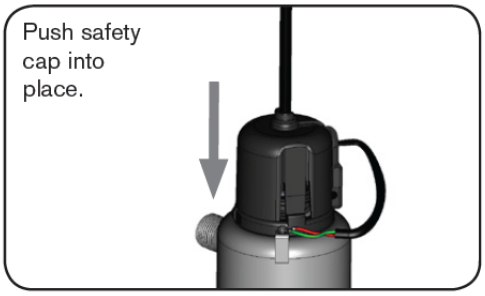

Reinstall sleeve bolt with 2 new o-rings.

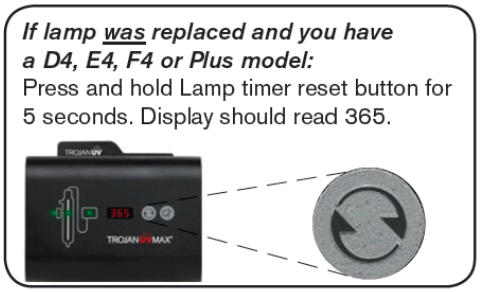

Remove o-rings and sleeve bolt from sleeve.

Screw lamp into sleeve hand-tight.
Caution: Over tightening will break the sleeve.
1
2


Make sure lamp/sleeve assembly is centered.
Caution: Over tightening will break the sleeve.
For Basic models, **skip to step 18**.
1
2


Align connections by rotating ring clamp (if equipped) to push lamp plug onto end of lamp.
ring clamp




If lamp was replaced and you have
a D4, E4, F4 or Plus model:
Press and hold Lamp timer reset button for
5 seconds. Display should read 365.

Check for leaks before leaving installation.

Calibration

TDS transmitter Calibration

- During normal operation, the transmitter displays the VIEW menu.
- When editing the CALIBRATE or OPTIONS menus, the transmitter will return to the VIEW menu if no activity occurs for 10 minutes.

- To select a VIEW display, press the UP or DOWN arrow keys. The selections will scroll in a continuous loop.
- Changing the VIEW display does not interrupt system operations.
- No key code is necessary to change display selection.
- Output settings cannot be edited from the VIEW menu.

Step 1. Press and hold ENTER key:
- 2 seconds to select the CALIBRATE menu.
- 5 seconds to select the OPTIONS menu.

Step 2. The Key Code is UP-UP-UP-DOWN keys in sequence.
- After entering the Key Code, the display will show the fi rst item in the selected menu.

Step 3. Scroll menu with UP or DOWN arrow keys.

Step 4. Press RIGHT ARROW key to select menu item to be edited.
- The first display element will begin flashing.

Step 5. Press UP or DOWN keys to edit the flashing element.
- RIGHT ARROW key advances the flashing element.

Step 6. Press ENTER key to save the new setting and return to Step 3.

Parts Per Million (PPM) Factor

This feature is only applicable when PPM display units are selected. The programmable PPM Factor is adjustable from 0.01 to 3.00 (factory default = 2.00). Determine the best PPM Factor for a process solution by calculating the solution's conductivity (µS) and the percent of total dissolved solids (PPM).

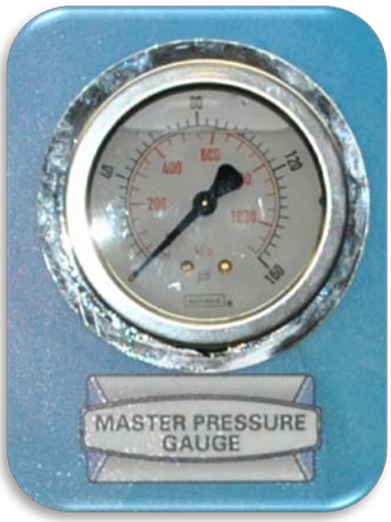
$$PPM\ Factor = \frac{Solution\ Conductivity\ (\mu S)/cm}{Total\ Dissolved\ Solids\ (ppm)}$$

$$TDS\ (ppm) = \frac{Solution\ Conductivity\ (\mu S)/cm}{PPM\ Factor}$$

Using a lab type/pre-calibrated to determine the PPM factor if you have one available.

Pressure regulator/relief valve Calibration

Calibrate the pressure regulator by looking at the master pressure gauge, make sure the



water will relief from the regulator when pressure is above 90 psi.

Warranty

THIS LIMITED WARRANTY COVERS THE PURIFIRE® 4S10F SYSTEM ONLY, PLEASE REFER TO THE FIRE APPARATUS MANUAL FOR WARRANTY INFORMATION ON THE FIRE APPARATUS YOU HAVE PURCHASED.

PURIFIRE® 4S10F system is warranted for a period of one (1) year from the date of purchase against defects in material and workmanship. This warranty covers original components manufactured or installed by W. S. Darley & Co.. Consumables items (filters, etc.) are not covered under this warranty. Refer to manual on detailed warranty coverage and manufacturers warranties.

This warranty is void if equipment is not installed and operated according to the instructions as listed in the Owners Manual. It does not apply to damage caused by abuse, accident, neglect, freezing, fire, or other abnormal conditions beyond the company's control. This warranty is void on any part from which the original manufacturing date code decal has been removed or made illegible. This warranty requires the use of W. S. Darley & Co. authorized replacement parts. All models must be operated and maintained in accordance with this Owners Manual.

This warranty shall be void if the influent water temperature exceeds 110 degrees F. or goes below freezing. This purifier is intended for use outdoor with cold uncontaminated surface freshwater only.

All defective parts must be returned to W. S. Darley & Co. for inspection and repair or replacement. Contact factory for a Return Materials Authorization Number prior to shipment. W. S. Darley & Co. will inspect, test and determine cause of defective component parts. W. S. Darley & Co. will have final determination as to which component parts are replacement of total units; and the cost of labor, new components, handling and packaging. Defective parts must be sent prepaid freight. W. S. Darley & Co. will not be liable for any labor charges other than factory repairs. Incidental or consequential damages are not covered by this warranty.

This warranty is valid once the customer completes the applicable Warranty Form. These forms must be sent back to the pertinent distribution center to keep on file.

PuriFire® 4S10F system is made in the USA.

The information and recommendations contained in this publication are based upon data collected by the W. S. Darley & Company and are believed to be correct. However, no guarantee or warranty of any kind, expressed or implied, is made with respect to the information contained herein. Specifications and information are subject to change without notice.

W. S. Darley & Co.
325 Spring Lake Dr. Itasca, IL 60143 U. S. A.

Warranty Registration Card

PuriFire® 4S10F

Thank you for purchasing PuriFire® 4S10F water purification system. To register your warranty for this product, complete the information below, tear off the card and then send to the above address. Thank you for choosing PuriFire.

Name: _____

Address: _____

City/State/Zip code: _____

Telephone: _____

Model purchased: _____

Date purchased: _____

Serial Number: _____

Detailer from which Purchased: _____

May we e-mail you information on other PuriFire products and promotions?

Yes: _____ No: _____

If yes, please provide your e-mail address: _____

Your e-mail address will not be disclosed to any third party.